AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in this application:

LISTING OF CLAIMS:

Claims 1 to 37. (Canceled).

38. (Currently Amended) A method of particle size and concentration measurement comprising the following steps:

using one or more lasers to produce a Gaussian laser beam;

using means for converting said Gaussian laser beam into ~~providing~~ a focused, synthesized, non-Gaussian ~~laser~~ dark beam;[[:]]

causing said particles to flow relative to a stationary dark beam or using a scanning mechanism to cause ~~causing~~ said beam to interact with said particles;

using a detection system to measure ~~measuring~~ the interaction signal and number of interactions per unit time of said dark beam with said particles; and

~~using~~ feeding an output of said detection system into a computer comprising algorithms adapted to map said interaction signals to said particle size and said number of interactions per unit time to said concentration[[;]]

~~wherein said focused, synthesized, non-Gaussian laser beam is a dark beam~~.

39. (Previously Presented) A method according to claim 38, wherein the particles are one of fluid borne, airborne, and on a surface.

40. (Previously Presented) A method according to claim 38, wherein the size of the particles ranges from sub-micron to thousands of microns.

41. (Previously Presented) A method according to claim 38, wherein the measurements are made in the intensity domain.

42. (Previously Presented) A method according to claim 38, wherein the measurements are made using the mapping of the interaction pulse width to particle size.

43. (Previously Presented) A method according to claim 38, wherein the focal properties of the laser beam are changed depending on the size and concentration range of the particles.

44. (Previously Presented) A method according to claim 38, wherein the non-Gaussian beam is generated by employing a mask over a Gaussian laser beam.

45. (Currently Amended) A method according to claim [[37]] 38, wherein the Gaussian beam is spatially modulated.

46. (Previously Presented) A method according to claim 45, wherein the Gaussian beam is one of spatially modulated by use of spatial-filter, a set of spatial filters, an electronic spatial light modulator, and a liquid crystal device.

47. (Currently Amended) A method according to claim 45, wherein the spatial modulation of the Gaussian beam is chosen from the group comprising:

(i) intensity modulation;

(ii) phase modulation;

(iii) wavelength modulation;

(iv) polarization[[,]] modulation; and

(v) combinations of these.

48. (Previously Presented) A method according to claim 45, wherein the spatial modulation is implemented statically.

49. (Previously Presented) A method according to claim 45, wherein the spatial modulation is implemented dynamically.

50. (Previously Presented) A method according to claim 38, wherein the non-Gaussian beam is generated by one of directly modifying the laser cavity and combining the beams from several lasers.

Claim 51. (Canceled).

52. (Currently Amended) A method according to claim 38, wherein the interaction of the focused beam with the particles is accomplished by providing [[a]] the scanning mechanism that provides a linear scanning path for said focused beam.

53. (Currently Amended) A method according to claim 38, wherein the interaction of the focused beam with the particles is accomplished by providing [[a]] the scanning mechanism that provides a rotary scanning path for said focused beam.

54. (Currently Amended) A method according to claim 38, further comprising the use of a second detection system to measure radiation scattered at 90 degrees to the beam direction one of (i) to verify single particle interaction in the focal area and (ii) as an additional dark field information.

55. (Currently Amended) A method according to claim 54, wherein the second detection system used to measure radiation scattered at 90 degrees to the beam direction comprises a CCD camera.

56. (Currently Amended) A method according to claim 54, wherein the second detection system used to measure radiation scattered at 90 degrees to the beam direction comprises several detectors.

57. (Previously Presented) A method according to claim 56, wherein the several detectors are connected in a way selected from the group: addition, differential, and coincidence.

58. (Currently Amended) A method according to claim 38, wherein [[a]] the detection system is used to measure radiation back-scattered from the particles.

59. (Previously Presented) A method according to claim 38, further comprising the use of a detector to measure radiation scattered at 90 degrees to the beam direction to detect smaller particles using dark field TOT measurement.

60. (Previously Presented) A method according to claim 38, wherein high concentrations of particles are measured by using a reflection, back scatter, mode, collecting the back-scattered interaction energy from the particle.

61. (Previously Presented) A method according to claim 56, wherein counting interaction signals, of the scanning laser beam, per unit time is used to measure high concentrations of particles.

62. (Currently Amended) A method according to claim 38, wherein the algorithms adapted to map the interaction signals to the particle size and the number of interactions per unit time to the concentration are explicitly based on said interaction signals.

63. (Currently Amended) A method according to claim 38, wherein the algorithms adapted to map the interaction signals to the particle size and the number of interactions per unit time to the concentration are based on an advanced artificial intelligence method.

64. (Currently Amended) A method according to claim [[38]] 63, wherein the advanced artificial intelligence method is a Neural Network or support vector method (SVM).

65. (Previously Presented) A system for particle size and concentration measurement comprising:

one or more lasers to provide a Gaussian laser beam;

a scanning mechanism;

means for converting said Gaussian laser beam into a focused, synthesized, non-Gaussian laser beam; and

detection means;

wherein said focused, synthesized, non-Gaussian laser beam is a dark beam and said means for converting said Gaussian laser beam into said focused, synthesized, non-Gaussian laser beam are chosen from the following group:

a combination of a spatial filter and a lens; and

a liquid crystal device.

66. (Previously Presented) A system according to claim 65 additionally comprising a second detection system to measure the radiation scattered at 90 degrees to the beam direction.

67. (Currently Amended) A system according to claim 65, additionally comprising a beam splitter to divert back-scattered interaction energy from the particle to the detection ~~system~~ means.

68. (Previously Presented) A method according to claim 38, wherein the synthesized, non-Gaussian laser beam is circular.

69. (Previously Presented) A method according to claim 38, wherein the synthesized, non-Gaussian laser beam is linear.

70. (Previously Presented) A method according to claim 38, wherein the particle size is determined by differential interference of the light scattered from said particle with the two lobes of a linear synthesized, non-Gaussian laser beam.

71. (Previously Presented) A method according to claim 38, wherein the particle size is determined by analyzing the polarization of the light scattered from said particle.

72. (Previously Presented) A method according to claim 38, wherein two or more confocal beams are simultaneously generated, each of said beams having a different wavelength.